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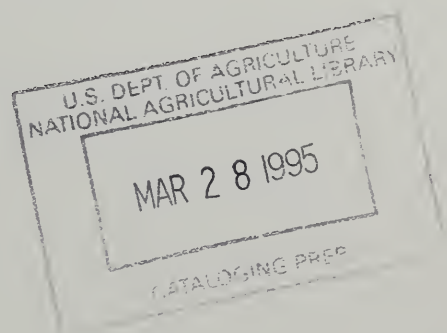


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WATER QUALITY PROGRAM PLAN
TO SUPPORT THE
PRESIDENT'S WATER QUALITY INITIATIVE

**U.S. Department of Agriculture
and
Cooperating State Agencies**

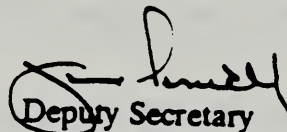
July 1989



PREFACE

The USDA Water Quality Program Plan to support the President's Water Quality Initiative was prepared by an agency work group appointed by USDA Agency Heads and coordinated by the Office of the Deputy Assistant Secretary for Science and Education.

Its purpose is to identify the objectives and procedures for the implementation of the USDA Water Quality Program Plan and to assure both internal and external coordination of the Department's water quality activities. The Report describes a schedule of 10 planned output-oriented and program support activities for the 5-year implementation period 1990-1994. This planned schedule is based on the expected extended availability of the President's 1990 funding proposal for the 5-year implementation period. It is a complex and challenging program whose success is dependent on sustained support.



Deputy Secretary
U.S. Department of Agriculture
July 1989

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DEPARTMENT OF THE HISTORY OF ARTS
AND ARCHITECTURE
OFFICE OF THE CURATOR
OF THE MUSEUM OF ART AND ARCHITECTURE
540 EAST 58TH STREET
CHICAGO, ILLINOIS 60637
TEL. 773-936-5000
FAX 773-936-5001
WWW.MUSEUMOFARTARCHITECTURE.ORG

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**WATER QUALITY PROGRAM PLAN
TO SUPPORT THE PRESIDENT'S WATER QUALITY INITIATIVE
USDA AND COOPERATING INSTITUTIONS**

EXECUTIVE SUMMARY

Background

USDA's response to the President's Water Quality Initiative brings a new focus and coordinated commitment to the goal of protecting the Nation's waters from contamination by agricultural chemicals and waste products applied on agricultural lands. The management of agricultural chemicals and wastes to meet environmental and public safety objectives is in many ways a new functional activity for USDA, particularly with its emphasis on groundwater contamination. It involves the capabilities and activities of more USDA Agencies, working in closer concert with a wider variety of Federal and State Agencies than any previously established Departmental function.

Objectives

USDA's overriding aim for the President's Water Quality Initiative is to provide farmers, ranchers and foresters the knowledge and technical means to respond independently and voluntarily in addressing on-farm environmental concerns and related State water quality requirements. The Department plans to achieve this objective in a way that reduces the need for restrictive regulation and in a manner that maintains agricultural productivity, avoids economic hardship and sustains an economic and safe supply of food and fiber. The Plan strives to: (1) determine the precise nature of the relationship between agricultural activities and groundwater quality; and (2) develop and induce the adoption of technically and economically effective agrichemical management and agricultural production strategies that protect the beneficial uses of ground and surface water quality.

USDA Water Quality Program Strategy

The USDA Water Quality Program will be carried out through three major, integrated and interdependent functional components: (1) Education and Technical Assistance; (2) Research and Development; and (3) Database Development and Evaluation.

(1) Education and technical assistance efforts will assist farmers, ranchers and foresters in applying new and improved agrichemical and waste management and agricultural production practices based on already available research results and new techniques, practices and systems developed through the research and development program component. The adoption of practices to reduce or prevent contamination will be encouraged and accelerated where existing or potential contamination of ground or surface waters from agricultural nonpoint sources has been identified as a public concern. Demonstration projects will be established in some of these areas and enhanced education, technical and some financial assistance will be provided in others beginning in the first year of the Program. Practice adoption will begin in the first year and accelerate in the subsequent years. Education and technical assistance will be provided for agricultural chemical management and production practices that are needed to meet State water quality requirements under Section 319 State water quality plans based on State-identified priorities, and for the specific water quality goals of multi-State regional water quality projects. Where appropriate, particular emphasis will be placed on agrichemical nonpoint sources of groundwater pollution.

(2) Research and development efforts will provide new and improved agricultural and forestry management practices and systems that will increase farmer, rancher and forester effectiveness in reducing the chances of water quality degradation for a wide range of conditions. Research is essential to expand and improve our understanding of the mechanisms that govern the movement of agrichemicals through soil and geologic materials and that govern how such chemicals become

available in forms that readily move through these media into groundwater. This new knowledge about the fate and transport processes of agrichemicals will provide the bases for developing new and improved practices and systems to control agricultural nonpoint sources of actual or potential water contamination. Analyses of socio-economic effects and impacts of current and new management methods on farm, community and regional bases will provide measures of the relative cost-effectiveness of alternative practices and systems.

(3) Development of comprehensive, consistent, periodic national data on agricultural chemical use, related farm practices, and links with the physical environment will provide the necessary basis for Federal agencies and State governments to assess the implications of current agricultural practices and to evaluate the consequences of alternative policies for reducing any adverse effects of agricultural production on water quality. Centralized systems for linking data and statistical information on agricultural productivity, land use, agricultural chemical use, physical attributes of the land and surrounding watersheds, climate, and water quality will support a variety of program decisions by a range of Federal and State agencies, including those requiring improved pesticide benefit assessment.

Planned Output and Program Support Activities. The foregoing functional components will be implemented through 10 major output-oriented and program support activities:

- Building National and State databases on agrichemical use and related farm practices
- Providing digitized geographic information systems for State and Federal evaluation of alternative policies and program strategies
- Developing methods for sampling, measuring, and evaluating groundwater contamination
- Conducting fundamental research to provide the basis for improved management of chemicals used in agriculture
- Improving agrichemical management and agricultural production systems
- Expanding USDA and CES staff capacity to deliver educational and technical assistance to producers for effective agrichemical and waste product management and environmental stewardship
- Demonstrating and delivering technologies and management systems for voluntary farmer, rancher and forester adoption and implementation
- Meeting State water quality requirements through education and technical assistance
- Evaluating economic, social and technical effects and impacts of new and improved management practices and systems
- Informing the public of program activities and achievements

These building blocks constitute a fully integrated system within which each set of outputs relies upon successful achievement of related program components to assure the Nation's producers are provided with profitable options for effective agricultural chemical management.

Interagency Coordination and Relation to Ongoing Programs

The planned activities of 8 principal USDA Agencies and the State Agricultural Experiment Stations and Cooperative Extension Services are closely coordinated with each other and with related activities of EPA and Agencies of the Departments of Interior and Commerce under the President's Water Quality Initiative. The USDA Water Quality Program will benefit from related, past and ongoing Departmental efforts in soil and water conservation, public information, research, and extension, and will complement the aims of other targeted programs such as Integrated Pest Management (IPM), Low Input Sustainable Agriculture (LISA) and the National Agricultural Pesticide Impact Assessment Program (NAPIAP).

**WATER QUALITY PROGRAM PLAN
TO SUPPORT THE PRESIDENT'S WATER QUALITY INITIATIVE
USDA AND COOPERATING INSTITUTIONS**

The President's Water Quality Initiative

USDA's contribution to the President's Water Quality Initiative brings a new focus and coordinated commitment to the goal of protecting the Nation's water from contamination by agricultural chemicals and waste products applied on agricultural lands.

President Bush recommended a new initiative for enhancing water quality in his 1990 budget proposal to the Congress, presented on February 9, 1989. The President's initiative defines a vigorous effort to protect ground and surface water from potential contamination by agricultural chemicals and wastes, especially pesticides and nutrients. The initiative integrates the combined expertise of Agencies from four Federal departments to promote the use of environmentally and economically sound farm production practices, and to develop improved chemical and biological pest controls.

The initiative, in its first principle emphasizes groundwater protection. Other principles and policies speak to agricultural nonpoint sources of water pollution in general. To support the initiative, the President proposed a \$41.2 million permanent increase to the current USDA \$140 million base funds which are now devoted to ongoing water quality programs and activities. The Department and cooperating State institutions understand that the main emphasis for the budget increase is on reducing ground water contamination by agricultural chemicals. Current programs addressing degradation of water quality as a result of agricultural practices are to continue.

In his statement of principles and policies, the President makes it clear that farmers are ultimately responsible for avoiding contamination of water resulting from management practices they apply to the landscape. He also stated that the role of USDA is to conduct research and provide education and technical assistance that helps producers fulfill their responsibilities by developing and demonstrating "...farming practices that avoid water quality degradation..." and that are economically viable.

The USDA, the cooperating State Agricultural Experiment Stations (SAES) and State Cooperative Extension Services (CES) are prepared to accept the responsibilities for their part in the President's initiative. A multi-Agency, multidisciplinary plan has been developed to meet the challenge head on. The planned program will clearly demonstrate that agriculture is concerned about the environment and that the agricultural sector can and will make the necessary changes to protect ground water quality. The plan also provides for input from and cooperation with other Federal and State departments.

PRIMARY GOALS AND OBJECTIVES OF THE USDA'S AND STATES' CONTRIBUTION TO THE PRESIDENT'S WATER QUALITY INITIATIVE

The primary goal of USDA's Water Quality Program is to:

Provide farmers, ranchers, and foresters the knowledge and technical means to respond independently and voluntarily in addressing on-farm environmental concerns and related State water quality requirements. The Department plans to achieve this goal in a way that reduces the need for restrictive regulation, and in a manner that maintains agricultural productivity, avoids economic hardship, and sustains an economical and safe supply of food and fiber.

The primary objectives of the multi-Agency, multidisciplinary plan for this program are to:

- *Determine the precise nature of the relationship between agricultural activities and ground water quality.*
- *Develop and induce the adoption of technically and economically effective agrichemical management and agricultural production strategies to protect water quality.*

Program Plan Involves Substantively New and Different Directions for USDA

The management of agricultural chemicals and wastes to meet environmental and public safety objectives is in many ways a new functional activity for USDA, particularly as it relates to groundwater contamination. It involves the capabilities and activities of more USDA Agencies, working in closer concert with a wider variety of Federal and State Agencies than any previously established Departmental function. It is a unique approach to solving a very complex issue.

The USDA water quality program is supplemental to existing programs. Its distinction arises from (1) its particular focus on agricultural chemicals and groundwater contamination, and (2) the extensive degree of interagency coordination, collaboration and program integration required to successfully achieve its goals. It builds upon a proud USDA history of accomplishment, expertise, and experience in basic and applied agricultural research, soil and water conservation, and a variety of farmer education and extension programs for the development and use of best management practices to protect soil and water sources in rural areas. Activities carried out under the President's Water Quality Initiative are expected to benefit from, as well as contribute to, ongoing programs.

The integrated development of basic data, the underlying science and technology, and the operational information and practices for implementation of effective agricultural chemical management systems will be accomplished through cooperative and collaborative Agency activities following the objectives and guidance of the Departmental Plan. No overall lead Agency will be designated.

USDA technical assistance programs relating to water quality have historically focused on reducing sediment and sediment-borne contaminants in surface waters as well as animal waste management and salinity control. The Department, SAES and CES biological pest control, integrated pest management, and nutrient management research and programs need to be linked with compatible efforts to understand and address groundwater contamination. Although the USDA, SAES and CES have the basic capabilities to address agricultural chemical and groundwater issues, the required data and information bases, and the coordinated delivery systems have not been developed and implemented for effective agricultural chemical management systems. The USDA response to the President's Water Quality Initiative rectifies these problems.

A total of 8 principal USDA Agencies and their cooperating State institutions and Agencies are collaborating with the Environmental Protection Agency (EPA), the United States Geological Survey (USGS), and the National Oceanic and Atmospheric Administration (NOAA) to produce a wide range of new and interrelated water quality program outputs.

The USDA's Water Quality Program plan is described in the following pages. The plan is built upon the foundation of successful, historical programs. It is designed to complement established targeted programs, such as Integrated Pest Management (IPM), and the National Agricultural Pesticide Impact Program (NAPIAP), and newer programs such as Low Input Sustainable Agriculture (LISA). Its successful implementation is expected to increase significantly the contributions of the established USDA base program to water quality and contribute importantly to a growing compatibility between agricultural production and environmental quality.

Principal USDA and Cooperating State Program Agencies Contributing to The Initiative

- **Agricultural Research Service (ARS)**
- **Agricultural Stabilization and Conservation Service (ASCS)**
- **Cooperative State Research Service (CSRS) in conjunction with the system of State Agricultural Experiment Stations (SAES)**
- **Economic Research Service (ERS)**
- **Federal Extension Service (ES), in conjunction with State and County Cooperative Extension Services (CES)**
- **Forest Service (FS)**
- **National Agricultural Statistics Service (NASS)**
- **Soil Conservation Service (SCS)**

Each lead Agency has a number of new, multi-Agency, multidisciplinary program activities, many of which are also coordinated with ongoing or refocused programs of other USDA Agencies, including the: **Animal and Plant Health Inspection Service (APHIS)**; **Farmers Home Administration (FmHA)**; and **National Agricultural Library (NAL)**.

Integrated Water Quality Program Plan is Output-Oriented

The USDA Water Quality Program will produce a closely-linked array of outputs and support activities: National and State data on agrichemical use; related information on soils and farm practices; new research knowledge on the fate and transport of agrichemicals; new and improved agrichemical management and agricultural production practices and systems; educational and technical assistance to farmers, ranchers and foresters as well as States and communities; evaluations of impacts and effects of new and improved practices and systems, and public information materials on the activities and accomplishments of the program. The successful integration and achievement of these interdependent program components will provide a new basis for the nationwide expression of the Department's commitment for mutual retention of National agricultural productivity and environmental quality. The Nation's producers will be provided means for cost-effective agricultural chemical and waste management and environmental stewardship, particularly for water quality.

The USDA Water Quality Program plan recognizes that some appropriate technology is currently available to improve agricultural chemical management. But, much remains unknown about the magnitude and extent of agriculture's effects on water quality, the specific nature of agricultural chemical fate and transport in water systems, and the economic and environmental tradeoffs among alternative production and agricultural chemical management systems. Thus, educational and technical assistance, research, and database development and evaluation, the three major functional components of the USDA Water Quality Program, will get underway concurrently. They will address ten output-oriented and program support building blocks which constitute the implementation strategy for the USDA Program. The program building blocks define "what needs to be done" to help producers use agricultural chemical and waste management technology, practices and systems that will contribute to the maintenance of agricultural productivity while protecting ground and surface water quality.

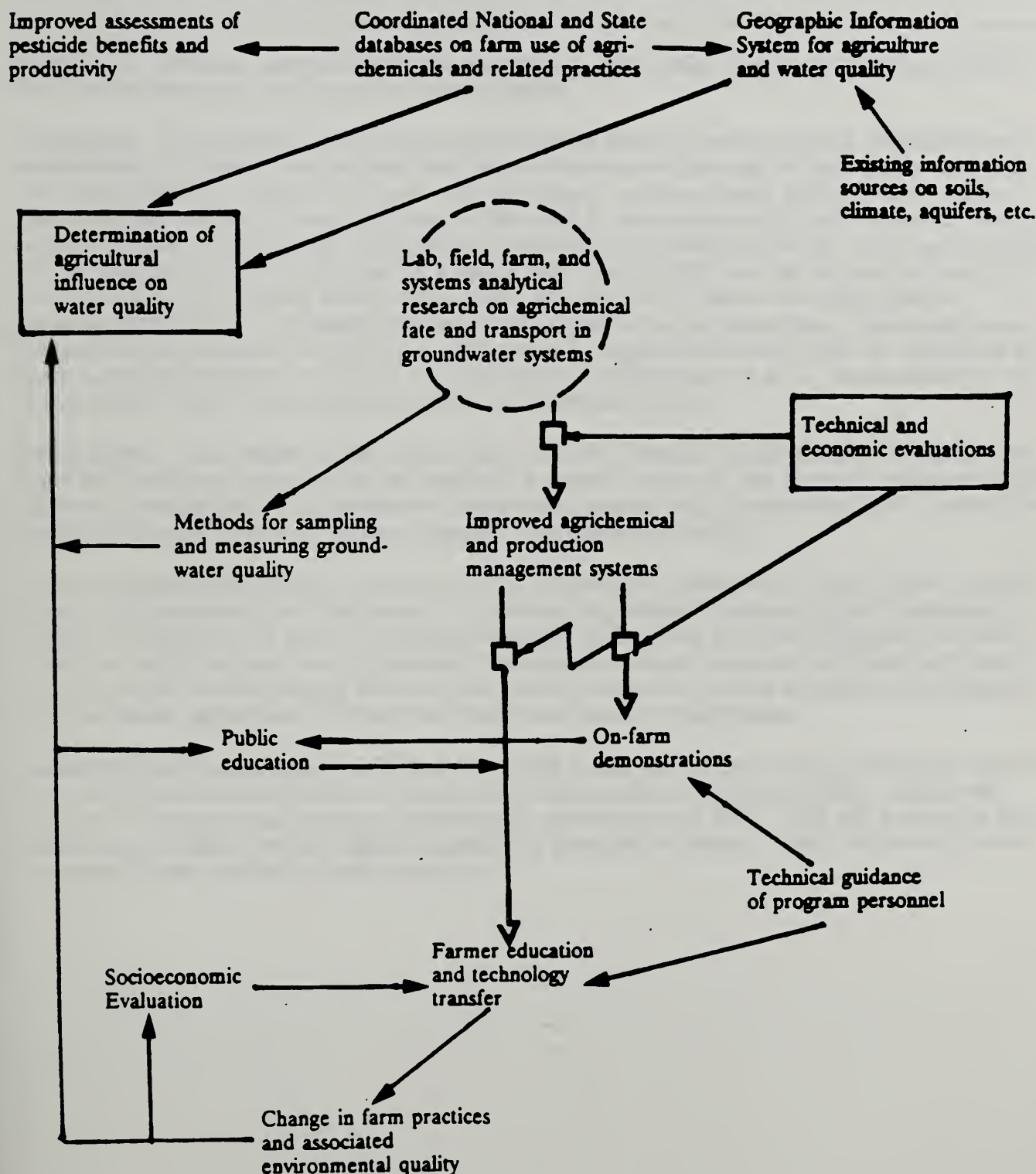
New and expanded National and State databases on agricultural chemical use and related practices, and the development of coordinated, digitized geographical information systems will provide the basis for producing improved pesticide assessments, evaluating agriculture's impact on the environment, selecting critical areas for targeting research, education, technical and financial assistance, monitoring change over time, and documenting improvements in productivity and environmental quality.

New fundamental and applied research activities will improve methods for sampling, measuring, evaluating groundwater contamination problems, and expand our knowledge and understanding of water contaminant sources, degradation processes and products, and chemical movement through soils. Critical longer-term research will be planned and conducted to better understand the persistence of contaminants where it occurs, or its absence. This research will produce new technologies and improved agricultural and forestry management systems that reduce the chances of water degradation.

A series of on-farm demonstration projects and other targeted farmer education and technical assistance efforts will speed the delivery of technologies and management systems to farmers. These efforts will initially focus on improving the transfer of available information and technology and to incorporate new findings, advanced technologies, and improved management systems as they emerge from the program's research efforts. Economic and social evaluations will assure that the management systems developed and extended are both practicable and profitable. Widely disseminated public information will facilitate community-wide understanding and acceptance of the need for increased compatibility between agriculture and the environment.

A schematic design of the linkages among the 10 output-oriented and program support building block components of the USDA water quality strategy is presented in Figure 1. Their objectives, procedures, intended beneficiaries, leadership roles, coordination and integration mechanisms, and delivery schedules are described on the following pages.

Figure 1. Schematic design of linkages among the output-oriented and program support components of the USDA Water Quality Strategy.



Planned Outputs and Program Support Activities

Building Nationally Coordinated Databases on Agricultural Chemical Use and Related Farm Practices

The development of comprehensive, consistent, periodic National data on agricultural chemical use, related farm practices, and links with the physical environment will provide the necessary basis for Federal Agencies and State Governments to assess the benefits, costs and other effects of current agricultural practices and to evaluate the consequences of alternative policies and practices for reducing any adverse effects of agricultural production on water quality.

Objectives: Develop, analyze, and disseminate timely, statistically reliable and detailed data on farm use of pesticides, fertilizers, and related inputs.

Procedures: A continuous cycle of commodity-specific, National surveys will be established and implemented to create cross-sectional and time-series data on farm use of agricultural chemicals and waste products. Survey instruments will be designed to concurrently collect data on related farm practices and the physical attributes of the land, in cooperation with SAES and CES, and in sufficient detail to satisfy local requirements consistent with available funding. Farm survey efforts will be initiated through a pilot test on a single crop in early 1990, and will proceed to cover all major and a range of minor commodities over a 3-4 year period before the cycle repeats. Resultant data will, at a minimum, be statistically significant at the State level. States and other Government Agencies will be given the opportunity to supplement survey funds for additional sub-State sampling to provide more site- and field-specific, locally relevant data. Summarized survey results will be widely disseminated via print and electronic media.

Beneficiaries: With regard to the USDA Water Quality Program, the data will: (1) provide one basis for identifying priority areas for research, education, technical and financial assistance efforts; (2) form a component of the geographic information system; and (3) support efforts to assess the benefits and costs of new agricultural chemical management strategies.

Improved agricultural chemical use data will: (1) substantially enhance EPA and USDA pesticide benefit-risk assessment activities under the National Agricultural Pesticide Impact Assessment Program (NAPLAP); (2) assist in targeting programs of the Food and Drug Administration and other food safety services; and (3) provide State Agencies which undertake additional sub-State sampling more intensive locally relevant data and a cost-effective means to assess the relationship between actual agricultural practices and State water quality requirements.

Leadership and Coordination: ERS and NASS will design the National surveys with input solicited informally from the other USDA Agencies and SAES, and from EPA and USGS. NASS will conduct the enumeration through a reimbursable agreement with ERS. ERS will summarize and disseminate the data and any related analytical or interpretive reports. SAES will develop more site-specific farm- and soil-specific databases.

Planned Schedule for Building a Nationally Coordinated Database on Agricultural Chemical Use and Related Farm Practices

			NAPIAP Applications and Benefits
1990	<p>Plan survey cycle for collection of use data by major and minor crops, and livestock categories. Select on crop for pilot test of survey.</p> <p>Develop preliminary survey questionnaire and solicit input and participation in questionnaire design from other Agencies. Conduct the pilot test.</p>	<p>Invite, solicit, and assess opportunities to enhance sampling activities at sub-State level.</p>	<p>Determine baseline for the independent, historical contribution of pesticides and of nitrogen fertilizers to growth in agricultural productivity.</p>
1991	<p>Summarize, interpret and disseminate findings from 1990 survey.</p> <p>Develop and pretest questionnaires for remaining major field crops, livestock, fruit and vegetable crops.</p> <p>Determine feasibility of expanding sample size in Midwest States that prove unable to supplement survey efforts to achieve sub-State reliability.</p>	<p>Initiate planned survey cycle by holding enumerator training and conducting 3 crop-specific surveys.</p>	<p>Estimate the cumulative effect of past pesticide regulation on the agricultural sector and rural communities through 1990.</p>
1992	<p>Summarize, interpret and disseminate findings from 1991 surveys. 1991 surveys.</p>	<p>Conduct 3-5 commodity-specific surveys as per planned survey cycle.</p>	<p>Continue to increase and enhance USDA capabilities to perform pesticide benefit assessments at the rate and of the form required for EPA benefit-risk determinations."</p>
1993 and beyond	<p>Continue to develop and implement surveys and summarize, interpret, and disseminate survey findings according to originally planned survey cycle, as expanded over time to accommodate emerging needs.</p>		

"In all years, through ongoing NAPIAP programs, generate data through expert opinion to fill survey gaps on the use of agricultural pesticides undergoing special review by EPA, and conduct pesticide benefit assessments by selected commodity and for large classes of pesticides. Utilize accumulating, National pesticide use data (collected via USDA surveys) to regularly update estimates of pesticide regulatory effects on the magnitude and distribution of farm input industries, rural communities, and water quality.

Developing a U.S. Geographic Information System (GIS) for Agriculture and Water Quality

The development of a digitized geographic information system for agriculture and water quality will link nationwide data and statistical information on agricultural productivity, land use, agrichemical use, physical attributes of the land and surrounding watersheds, climate, and water quality, to support a variety of policy and program decisions by a range of Federal and State Agencies.

Objectives: Determine on a national basis, the locations and relative intensities of potential water quality problems which are independently indicated by concomitant geographic occurrence of specific geomorphologic systems, soil types, geologic sequences, vulnerable water systems, land uses, agricultural practices, farm types, and weather systems.

Many Federal Agencies have planned or ongoing activities to compile and distribute descriptive national data sets. A few relevant examples include: the collection of data on soil properties through the SCS and national Cooperative Soil Survey program; NOAA's extensive records of weather and climate data; EPA's national well water survey; USGS compilation of the characteristics of the nation's hydrologic systems; ASCS farm and program participation records; APHIS collects data through its cooperative plant and animal health monitoring system; and ERS and NASS national surveys on agricultural land use, agricultural practices, and farm costs and returns. The value of these independently detailed databases could be enormously enhanced by merging them to discover the interrelationships among various physical, agronomic, and economic characteristics and by improved accessibility to these data and information by all interests.

Procedures: Because the various data sets originate from different sampling procedures, are stored in different forms, and are statistically reliable at different levels of geographic specificity, simple mapped overlays of current information are neither possible nor valid without extensive data reconciliation. Thus, initial steps for the development of a comprehensive GIS involve putting the various component data in compatible format and conducting statistical procedures to determine the nature of statistically reliable geographic overlaps among the disparate databases. Data not already georeferenced in digital format will be digitized and a computer-aided stratification for survey sampling will be developed to reconcile data sources. As the various data become available in newly consistent and compatible forms, they will be merged to create a GIS which combines data on agricultural activities with data on climatic, hydrologic, and other physical attributes.

Beneficiaries: The nationwide GIS on agriculture and water quality will be accessible to any Agency with research or program goals that can be enhanced by this comprehensive digitized data system. The availability of the GIS will form a tangible basis for increasing interagency cooperation and increased consistency among Government programs.

Knowledge of the geographic relationships between potentially problematic conditions and practices will directly contribute to the selection of sites and future focus of ground water research, education, demonstration, and technical assistance efforts under the USDA Water Quality Program. Benefits should accrue to a wide range of other, unrelated programs of all participating Federal Agencies and to State and local program Agencies as well as the private sector.

Leadership and Coordination: NASS, in close cooperation with SCS and CSRS-SAES, and with input from a wide range of Federal and State Agencies, will lead the effort to build, make operational, and maintain the GIS. The agricultural chemical use data to be collected under USDA's Water Quality Program will be an important component of the GIS. Within the Department, activities will be coordinated through the existing USDA Geographic Information Systems Subcommittee of the Natural Resources and Environment Committee. Especially heavy collaboration between USDA and USGS is anticipated.

**SEQUENCE OF ACTIVITIES REQUIRED TO DESIGN AND
CONSTRUCT A COMPREHENSIVE U.S. GEOGRAPHIC
WATER QUALITY INFORMATION SYSTEM FOR AGRICULTURE**

1990: Conduct research on geographic information system (GIS) methodology (NASS; SAES)

Digitize soils interpretation and NRI data (SCS).

Incorporate USGS digital data into USDA sampling procedures (NASS).

1991

to

1992: Develop statistical procedures to use high resolution satellite imagery in locating cultivated land in geographic proximity to surface water (NASS; NOAA).

Construct cartographic overlays of currently available digitized geographic data on soil and water systems (SCS; USGS).

Determine how to optimally integrate imagery, digital topographic, ground and farm-level, field-level, and other survey data to maintain statistical integrity (above and beyond cartographic integration) -- (NASS).

Develop procedures to automatically classify and identify physical and biological barriers to ground and surface water contamination, for use in GIS database (SCS; ARS; USGS; EPA, NASS, CSRS/SAES).

1993

to

1994: Develop data structures and computer processes for GIS construction (NASS, SCS).

Provide data, in appropriate form for GIS integration on: soils and National Resources Inventory (NRI) (SCS); farm and conservation program participation (ASCS, SCS); cropping patterns (NASS); agricultural input use (ERS); weather patterns (NOAA); hydrology, geology, and topography (USGS); and water quality monitoring and test results (EPA).

Merge reconciled data to form a U.S. Geographic Water Information System for Agriculture (NASS and SCS, with input from Agencies indicated above).

Apply GIS databases to describe coincidence of agronomic, physical and economic phenomena to water quality problems.

Developing Improved Methods for Sampling, Measuring and Evaluating Groundwater Contamination Problems

General and site-specific research on agricultural chemicals in groundwater requires early development of new, rapid and lower cost field and lab techniques for sampling and measuring contaminants and identifying their sources and flow paths. Development and application of such tools are thus among the initial priorities of research efforts.

Objectives: Assess the extent to which agricultural practices contribute to contamination of ground water. Develop improved procedures to measure and evaluate the physical, chemical, and microbial processes involved in the movement of chemicals through the soil and into ground water.

Procedures: Research will be conducted to develop and improve laboratory and field methods for rapidly, reliably, and cost-effectively sampling and analyzing pesticide residues and other contaminants and for determining the rates at which water and chemicals move through soil to groundwater, and for interpretation of analytical results. Initially, research will give priority to developing improved sampling and analytical methodologies. Improved sampling methodologies will provide the means to obtain accurate and representative data at a reduced cost, including in situ pesticide analytical methods, leachate and groundwater recharge measurement and sampling methods, and sampling strategies and protocols that accurately determine spatial and temporal variabilities. Also, it will be necessary to develop improved methods for agricultural chemical handling and disposal so that subsequent research on agricultural chemicals in groundwater can isolate the effects of point from nonpoint sources of potential contamination.

Beneficiaries: Virtually any Federal, State, or local Agency involved with environmental monitoring will benefit financially and scientifically from the availability of accurate, reliable, and lower cost sampling, measurement, and evaluation tools. Furthermore, the application of these methods within the President's Water Quality Initiative will serve the general public and administrative needs to gauge the nature and extent of agriculture's independent contribution to observed groundwater quality problems.

Improved protocols will lead to greater efficiency in the collection of groundwater quality measurements in conjunction with national, State, and local site-specific surveys on farm use and effects of agricultural chemicals and related practices. Their widespread application will contribute to the value of data represented in geographic information systems. Evaluation of findings from their use will provide the fundamental basis for determining and communicating the current situation and future outlook for agriculture's relationship to water quality.

Leadership and Coordination: USDA research on and development of soil and groundwater sampling, measurement, evaluation, and agricultural chemical disposal and isolation tools will involve the joint efforts of ARS, CSRS and SAES, and FS. Research will be coordinated with USGS and EPA efforts, and will be designed to develop sampling, analytical, and statistical methodologies for surface and groundwater quality. NASS, ARS, and SAES will determine the feasibility of conjunctive collection of groundwater quality and farm practice data from farmers. ARS and SAES will reconcile groundwater quality data with statistical information on management practices and the physical attributes of the land.

PLANNED ACTIVITIES AND OUTPUTS FOR SAMPLING, MEASURING AND EVALUATING GROUNDWATER CONTAMINATION PROBLEMS

1990 On-farm techniques for inexpensive,
rapid cleaning/disposal of pesticide
containers made available.

1991 Improved field and lab techniques for
evaluation of water quality (e.g.,
rapid, lower cost detection and
vadose zone sampling) released.

Improved sampling and measurement
methods installed on system research sites.

1992 Release improved on-farm pesticide
cleanup techniques.

Incorporate water quality sampling into
agrichemical use survey efforts.

**1993
and
later
years** Release new and modified methods
for data acquisition.

Planned Outputs and Program Support Activities

Conducting Fundamental Research to Provide New Technology and Knowledge for Improved Management of Chemicals Used in Agriculture

Development of improved management of agricultural production systems that prevent contamination of groundwater is highly dependent upon understanding mechanisms that govern the persistence and movement of agricultural chemicals through soil and geologic materials, and that govern how such chemicals become available in forms that readily move.

Objectives: Identify and understand the biological-physical-chemical processes that determine how agricultural chemicals change or persist in the soil and how they and their breakdown products move downward to enter groundwater. This research is the core of understanding the principles involved in chemical degradation, reactions, and persistence in soils and water.

Procedures: Basic studies will be made to document the sources and amounts of potentially hazardous contaminants in groundwater attributable to agricultural and forestry practices, and to identify and determine the significance of the basic processes involved in their movement through soil into groundwater. Results of these individual studies will be assembled into integrated subsystems and process models.

Laboratory and field studies will be conducted at sites throughout the Nation to fill the knowledge gap that currently exists in understanding the fate of chemicals from pesticides, fertilizers, and wastes, and the linkages between agricultural chemical application to land and the occurrence of residues in groundwater. Knowledge of individual processes and integrated subsystems is absolutely essential so teams of scientists can develop new agricultural management systems that reduce or prevent leaching of chemicals from farm fields to underlying groundwater.

Beneficiaries: Ultimately, this work is critical to understanding processes in soils and the maintenance of an environmentally acceptable groundwater quality. All segments of society will benefit. Scientists, extension, education and technical advisors will receive more accurate information for use in developing new materials to assist the Nation's producers in improving their effectiveness in both agrichemical management and environmental stewardship. Agricultural producers will receive immediate benefits in the form of well-founded management systems with which to carry out their responsibilities to themselves, their families and to society.

Leadership and Coordination: USDA research will be led through the joint efforts of ARS, CSRS, SAES, and FS and coordinated with USGS groundwater quality research and with the needs of SCS, FS, and EPA.

**Planned Schedule for Fundamental Research Activities to Determine
and Understand Mechanisms that Govern the Persistence and
Movement of Agrichemicals through Soils and Geologic Materials**

- 1990** Initiate fundamental research on priority water quality problems through the grant process
- Water quality measurement and sampling instrument installation started on field and farm sites
- Models to evaluate management systems for their effects on groundwater quality
- 1991** Continue fundamental investigations and initiate additional components of research on prioritized objectives
- Monitor water quality in relation to agronomic practices and physical attributes of land
- 1992** Begin release of individual systems component studies (e.g., sorption of pesticides on soil complex; occurrence and importance of preferential flow paths). Continue basic studies, as needed and initiate new studies on basic problems and identified gaps in models
- 1993** Release refined models for assessing agricultural effects on groundwater quality
to
- 1994** Continue basic studies as needed

Improved Agricultural Chemical and Production Management Systems

The ultimate goal of systems analytical and site-specific research activities is the knowledge-based development of new, practical and profitable management systems that reduce environmental loading of contaminants from agrichemicals and waste products while maintaining agricultural productivity and water quality.

Objectives: Improve existing and develop new, cost-effective agricultural systems to address water quality problems.

Procedures: A major effort will be devoted to applying the systems approach to develop specific options to address effects of agriculture on water quality. These systems will include alternatives for managing soils, crops, chemicals, and water to maintain farm profitability and enhance soil and water quality. Systems will also be adopted for field use and tested for safe and environmentally sound storage and handling of pesticides.

Systems developed will be approached on a crop and regional basis. One such program is the Midwest Initiative which will focus on the development of cost-effective and environmentally safe corn and soybean production systems. Other managements systems are being evaluated concurrently in several other areas of the country, both in on-going programs and through grants.

Research sites in the Midwest will be chosen in representative production areas overlying significant aquifers. Researchers will measure key inputs and outputs of water and chemicals on each site to determine rates and amounts of chemical loss to water and will collect data on economic costs and returns.

Development of system simulation models is well underway at several State and USDA locations across the country. Completion of this on-going research and the use of the resulting models will allow tentative or trial release of practice recommendations and selection of promising management systems for field testing and verification in a relatively short time in the Midwest Initiative. In addition, development of expert systems or other decision aids that incorporate current best knowledge regarding agricultural chemicals management should be released for use during the second year of the Initiative. Related research in on-going programs, new grants from the new Water Quality Initiative and the Midwest Initiative will be coordinated into an integrated overall water quality program.

Evaluation of new management systems for corn and soybean production at targeted sites in the Midwest will require a start-up period of up to 2 years. Preliminary evaluation of some systems may be possible after 3 years in the absence of drought or other weather-related problems. However, depending on the length of crop rotations, time for chemical treatments to be expressed in groundwater, and considering weather vagaries, 12 to 15 years may be required to fully evaluate the effectiveness of the systems in preventing groundwater contamination. After field installations, sample analysis and initial model development are completed at Midwest sites, it should be possible to shift funds to further increase research on serious fundamental knowledge gaps, to broaden coverage of Midwest problems, and/or extend research to other areas of the country.

Beneficiaries: The products of research on agricultural chemical and production management systems will feed directly into the USDA Water Quality Program's education and technical assistance efforts, whose principal beneficiaries are the farmers, ranchers, and foresters to whom cost-effective management systems for ground water protection are extended. As with most research efforts of this magnitude, useful technological spin-offs will likely arise.

Leadership and Coordination: ARS, CSRS, and State cooperators at the Land Grant universities have the lead roles in USDA's water quality research plan. They will ensure that new water quality research projects are coordinated with existing and related projects and that new research is sharply focused on filling the gaps in information and technology for assessing and managing ground water quality. ERS and NASS will coordinate with ARS, CSRS, and State cooperators to assure uniform parameters, definitions and measures of farm costs, returns, and productivity are used in the analysis of economic and social consequences of alternative management practices and systems and agricultural policies.

The Midwest Initiative will be conducted in cooperation with the Midcontinent Initiative of the U.S. Geological Survey. USDA and USGS have appointed representatives to each other's planning committees.

PLANNED OUTPUTS AND PROGRAM SUPPORT ACTIVITIES FOR IMPROVED AGRICULTURAL CHEMICAL AND PRODUCTION MANAGEMENT SYSTEMS

1990	Field sites for determining impact of alternative management practices upon agricultural chemical losses to ground water selected and characterized.		
1991	Measurement and sampling instrument installation on field sites Demographic, economic information collected in study areas; base-line studies completed.	New alternative management systems for alleviating ground-water problems such as use of new tillage or pest management practices based on off-shelf knowledge and on-going research.	
1992	Production management research evaluation site installation completed.	Costs and benefits of alternative management systems for "whole farms," and estimated impacts on farm costs, returns and productivity.	Release preliminary assessment of accumulative effects of management activities in time and space for mixed use (timber and cropland) areas.
1993	Improved models and management systems, and producer decision aids for their implementation.	Second year soil, chemical and crop management site effects allow drawing first tentative conclusions on water quality impacts from modified management systems that are single-cropped (no rotation).	First tentative conclusions based on 3-year results of studies on mixed land-use study.
1994	Redirect part of USDA support from Midwest Initiative to other areas.	Analysis of socioeconomic consequences of second round of modified management practices and agricultural policies directed toward protecting groundwater.	

*Dependent on funds being made available to the Forest Service for this purpose in FY 1991.

Planned Outputs and Program Support Activities

Expanding USDA and CES Staff Capacity to Deliver Educational and Technical Assistance to Producers for Effective Agrichemical and Waste Product Management and Environmental Stewardship

USDA and CES staff capacity for the planning, delivery, and analysis of water quality protection procedures and improved agricultural chemical and production management systems will be expanded and enhanced through updating the Soil Conservation Service Field Office Technical Guides, other references, and through organized professional training.

Objective: Provide USDA and CES field office personnel the detailed technical knowledge and ability to accomplish the farmer education and technology transfer goals of the water quality program in every agricultural county in America.

USDA and CES educational, technical, and program personnel are located in each U.S. State and every agricultural county in America to assist farmers, educate the public, and carry out other program priorities which, at present, involve limited focus on ground water quality related to agricultural chemical use. Much of the achievement of the USDA Water Quality Program's farmer education and technology delivery goals will depend squarely upon these field-based representatives. Detailed field guides and organized professional training on new concepts and technologies pertaining to agricultural chemical and waste product management and related environmental stewardship are essential to develop that delivery capacity.

Procedures: A significant component of the technical support capabilities activity will be the education and training of field office personnel to deliver expanded programs, develop or refine water quality practice standards and specifications, implement Geographic Information Systems (GIS) technologies, and conduct monitoring and evaluation, including the analysis of results and the refinement of technical procedures. SCS and ES will publish information material to provide technical guidance on the environmentally responsible management of pesticides, nutrients and waste products for use by farmers, foresters, farm advisors, agribusinesses, and local, county, and State Agencies.

Workshops and special training sessions will be held for USDA and State Agency personnel. A prerequisite to this training will be the selective expansion of ES and SCS technical staffs to ensure that an adequate level of professional support is available.

Beneficiaries: Farmers, ranchers and foresters will directly benefit from access to an expanded cadre of thoroughly and well trained Federal and State Agency personnel who possess state-of-the-art knowledge on agricultural chemical and production management strategies to meet environmental stewardship objectives for protecting water quality.

Leadership and Coordination: Technical Guide preparation and professional training will largely be conducted by and for ES, CES, SCS and FS personnel, who will call upon the expertise of other lead USDA Agencies, EPA, and USGS as technical resources, trainers, and reviewers of draft technical materials. State Agency personnel and field representatives of other Federal Agencies, such as ASCS, will be invited to participate both as trainers and trainees, as appropriate.

PLANNED ACCOMPLISHMENTS TO IMPROVE USDA AND CES TECHNICAL SUPPORT CAPABILITIES

	Technical training	Water quality field staff expansion	Technical materials
1990	Totals of 4,000 Federal ^{1/} and 2,500 State Agency ^{2/} personnel trained.	A total of 40 new technical specialists hired.	Technical materials representing current state of knowledge on agrichemical management and the effects of conservation practices on groundwater and surface water will be developed for an estimated 2,600 field offices.
1991	A total of 8,000 Federal and 5,500-6,000 State Agency personnel trained.	Between 20-30 new technical specialists hired.	Technical materials prepared for an additional 600 field offices. Former materials updated to incorporate new findings from research efforts.
1992	A total of 3,000 Federal and 1,000-2,000 State Agency personnel trained.	Between 15-25 new technical specialists hired.	Outdated training and technical materials replaced with new guidelines on advanced manage- ment strategies arising from research and development efforts.
1993 and beyond	Technical guides continuously revised and updated to rapidly reflect new knowledge, understanding, and management of agricultural chemicals, waste products, and water resources.		

^{1/} Federal includes ASCS, SCS, and CES (State level)

^{2/} State agency includes county extension agents, conservation district staff, State and local agency personnel and others.

Planned Outputs and Program Support Activities

Demonstration Projects

Large scale demonstrations and application of currently available and new technology involving many commercial farming operations in large, contiguous land areas will demonstrate to producers, the public and environmental interests that State requirements for ground and surface water quality can be met effectively and voluntarily. Site-specific on-farm demonstrations of improved practices to reduce the transport of agrichemicals through soils and potentially to groundwater will be established to accelerate producer adoption and implementation.

Objective: Encourage accelerated adoption of appropriate technology by producers, as a means of achieving voluntary, cost-effective, and substantial reduction in the loadings of agricultural chemicals to the environment where there is evidence of a water quality problem relating to agriculture. Demonstrate for the soils, climate, cropping and farming practices in each project area how quickly and effectively producers can modify their pesticide and nutrient inputs, conservation systems, tillage and management practices to reduce the movement of agrichemicals and waste products through soils and potentially to groundwater and surface water.

Procedures: Projects will be located in multi-county areas to address nonpoint source water quality impairment under specific agricultural, soils, and geologic conditions; and where the water resource has high economic and environmental value. For these projects, critical nonpoint sources of contamination will be identified and specific treatment goals established. Utilizing the best available research data, cost effective resource management systems that integrate efficient production practices with agricultural chemical management will be designed for each demonstration area. Projects will demonstrate to commercial farmers, ranchers and foresters, on their own and their neighbors' lands, pesticide and nutrient management systems that minimize ground and surface water loadings of agricultural chemicals and wastes. Economic, social, and environmental barriers to adoption of these systems will be identified and cost effective solutions to overcome these barriers will be demonstrated. Some financial assistance will be available under the Department's Agricultural Conservation Program. Projects will be evaluated on the extent that improved practices are adopted by producers in each area, the costs of implementation, and the environmental improvements obtained as modified production systems are implemented. Results will be adapted for regional use after 3 years.

Beneficiaries: Farmers and private foresters are the direct beneficiaries of extended knowledge and technology that will allow them to reduce voluntarily the adverse impact of their activities on water quality without incurring economic hardship. Producers, the public and environmental interests will be informed about the agricultural and environmental effectiveness of the projects and the voluntary producer implementation of improved practices. Successful producer adoption of environmentally beneficial practices will also reduce pressure on State and Federal budgets by reducing the need for costly regulatory and enforcement programs.

Leadership and Coordination: The Extension Service and the Soil Conservation Service will provide joint leadership for the implementation of on-farm demonstration projects. The Agricultural Stabilization and Conservation Service will provide financial assistance. The Forest Service has plans to initiate similar projects for forestry management beginning in 1991. APHIS will like results from the projects to its existing and new regional biocontrol and IPM projects. Demonstration project implementation will require coordination among USDA Agencies, and with the Environmental Protection Agency, and Agencies of the Departments of Interior and Commerce. Cooperating State Agencies, conservation districts and other local entities will be involved in planning and implementing projects.

Collaborating Agencies will provide advice on the selection of demonstration sites that will complement technology and management system research and development activities and that will extend the research results to other geographic regions with specific, identified groundwater quality problems.

Planned Sequencing and Practice Adoption for On-Farm Demonstration Projects

1990	<p>Initiate first 8 projects</p> <ul style="list-style-type: none"> --recruit farmer participants --select initial set of management to be demonstrated --establish specific evaluation criteria --farmer adoption and implementation of practices begins 	<p>Select sites for subsequent demonstration projects</p>	
1991	<p>Implement first 8 projects</p> <ul style="list-style-type: none"> --assist participants in adoption of extended management practices --collect farm level and area-wide data for evaluation purposes --farmer adoption of practices accelerates 	<p>Initiate second set of 8 projects</p>	<p>Select sites for subsequent demonstration projects</p>
1992	<p>Evaluate mid-term success of first 8 projects. Adapt and update management plans to incorporate newly developed technologies and management systems. Farmer adoption of practices culminates</p>	<p>Implement second set of 8 projects</p>	<p>Initiate third set of 8 projects</p>
1993	<p>Agencies continue to use on-farm demonstration projects for accelerating improved practice adoption while producers maintain installed practices on the demonstration project farms</p>	<p>Adapt, update, and improve management strategies demonstrated in ongoing projects</p>	
1994	<p>Evaluate the performance and effects resulting from first 8 projects</p>		<p>Continue adapting current projects to take advantage of water quality research findings</p>

Meeting Water Quality Requirements through Education and Technical Assistance

Education and technology transfer efforts will be targeted to farmers, ranchers, foresters, and rural Agencies who need or seek assistance in implementing management practices that will meet specific State water quality requirements such as those developed for Section 319 water quality plans or specific goals of State, multi-State, regional water quality programs. Where appropriate, specific emphasis will be placed on agricultural nonpoint sources affecting groundwater.

Objective: Provide the background, technology, and consultation support that will allow farmers, ranchers, and foresters to meet formalized State and regional water quality objectives without experiencing economic hardship.

In response to the provisions of Section 319 of the Clean Water Act as amended in 1987, each State is required to submit to EPA a State Nonpoint Source Management Program which indicates the degree to which agriculture is believed to contribute to identified ground and surface water quality problems in the State, and a management plan to reduce identified sources of nonpoint source pollution to the maximum extent possible. Likewise, a number of interstate, interagency efforts, such as the Chesapeake Bay Program and Great Lakes Program, have ongoing initiatives to reduce nonpoint agricultural source contamination of regional watersheds. Agricultural producers who are expected to contribute to State and regional program goals, must be given the knowledge and technology to do so.

Procedures: A major emphasis of this activity is to provide education and technical assistance in hydrologic units identified as significant agricultural contributors to water quality problems by the State Section 319 Assessment Reports. Hydrologic units will be ranked at the State level and selected on the basis of: (1) significance of the agricultural sources of pollution; (2) priority for addressing groundwater problems; (3) relative priority of pollutants (pesticides, animal wastes, nutrients); and (4) integration with other water quality efforts. For each hydrologic unit selected, the nonpoint sources of pollution will be identified and specific treatment alternatives developed. Appropriate existing practices, and improved or new practices as they become available, will be applied to meet the specific water quality improvement needs in the hydrologic unit. Education and technical support will be provided to land owners and local Agencies to assist the implementation of new practices. Experience gained through previous and ongoing water quality programs will serve as one basis for hydrologic unit treatment.

Ongoing educational and technical assistance will be continued for multi-State regional projects which have already established that their most immediate problems are degradation of surface water by nutrients and/or animal wastes. Similar assistance will be extended to new regional projects which qualify. Additional assistance to regional projects will be provided to implement agricultural chemical management plans and the application of water quality education and technology capabilities to support objectives established by the regional management Agencies.

Beneficiaries: By assisting agricultural producers in meeting established State and regional water quality goals and requirements, the beneficial uses of water and its quality will be protected and the need for onerous or costly regulation will be avoided. Thus, benefits accrue directly to farmers, ranchers and foresters in the form of cost-effective alternatives, and to local, State, and Federal Government Agencies in terms of reduced costs, and to the public in terms of agriculture's independent contribution to water quality protection. As a result of USDA assistance and recommendations to the States, it is anticipated that more State and local Governments will adopt SCS standards and guidelines as a basis for their own initiatives to address the use of agricultural chemicals. This should be a factor in promoting consistency among State programs for agrichemical management.

Leadership and Coordination: SCS and ES will jointly lead educational and technical assistance efforts under an existing Memorandum of Understanding Relating to the Implementation of Water Quality Activities. The Forest Service plans to initiate projects relating specifically to ground water quality related to forestry. An interim Memorandum of Agreement establishes the framework for USDA cooperative efforts with EPA. Greater involvement with EPA will include providing technical assistance to support the development of State plans under Section 319 of the Clean Water Act, as amended in 1987 and administered by EPA.

SCHEDULE OF PROJECT DEVELOPMENT AND TARGETED ACCOMPLISHMENTS OF EDUCATION AND TECHNICAL ASSISTANCE TO MEET STATE WATER QUALITY REQUIREMENTS AND GOALS

Project Development Schedule:

	1990	1991	1992	1993	1994
Number of plans and strategies developed and target adoption goals identified for nonpoint source hydrologic units	110	65	55	45	—
Number of nonpoint source hydrologic unit projects initiated	37	73	65	55	45
Number of water quality plans, strategies, and target adoption goals identified for regional water quality programs	95	50	45	40	—
Number of new project areas initiated within existing regional projects	45	50	50	45	40

Targets for Accomplishment of Goals:

	Number of years after a project's initiation				
	1	2	3	4	5
Percent of management plans and practices adopted by producers within hydrologic unit or region	5	20	50	75	100
Data from nonpoint source hydrologic unit projects analyzed	→				Year 5
Data from expansion of regional projects analyzed	→			Year 4	

Planned Outputs and Program Support Activities

Economic, Social, and Technical Evaluations

Evaluations will be conducted at each stage of management system development, extension, and implementation to assure that new and demonstrated technologies and systems are practical and profitable and maintain productivity, and to design incentive and education programs to assure widespread adoption of effective management systems.

Objectives: Determine the economic and technical feasibility and expected consequences of producer adoption of new technologies and management systems before they are recommended, and follow up to document, refine, and assess actual performance of programs in achieving adoption and water quality goals.

Procedures: USDA will conduct evaluations of the effectiveness of its water quality activities at all levels from individual projects and individual components of projects to the national level.

The overall USDA evaluation will be summarized in an annual report which evaluates the progress of each building block component and the initiative as a whole.

An evaluation requirement will be built into each research plan. Proposals and final research reports will be evaluated to ensure that research results are both technically correct and responsive to practical problems. Cost effectiveness of recommended solutions will be a major consideration.

Evaluation of demonstration, education, technical and financial assistance components will assess whether agricultural chemical and production management systems extended to producers incorporate the best management practices called for in local, State, and regional, and local planning; whether and to what extent these systems are adopted by landowners; whether water quality models and monitoring data indicate that practices are achieving planned water quality goals; and the extent to which management system implementation complements or conflicts with other agricultural, environmental and social goals.

The program's database components will be evaluated through assessment of the timeliness, level of detail, and statistical reliability of the data collected and the usefulness of the data to policy makers, researchers, and action program Agencies.

Beneficiaries: Farmers, ranchers, and foresters, the primary target beneficiaries of the USDA Water Quality Program, will benefit from assurances that their needs and constraints are given attention through economic, social, and technical evaluations. Evaluation reports will guide USDA program administration and inform Federal and State legislators and related program administrators about expected and documented effects of the USDA effort.

Leadership and Coordination: The 8 principal USDA Agencies will participate in coordinated evaluation efforts. ARS and CSRS-SAES will lead technical evaluation efforts. ERS will lead economic and social evaluation activities but rely heavily on collaboration with agricultural economics and social science personnel in SCS, ES, ASCS, FS, and the State Land Grant universities. Annual report preparation will be coordinated by the USDA Water Quality Task Force.

Examples of planned evaluation reports are shown on the facing page.

PLANNED USDA WATER QUALITY PROGRAM EVALUATION REPORTS

Subject of report(s)	Target release date(s) (FY)
Success of 1990 agrichemical use and related practices survey pilot test in meeting USDA, EPA, and USGS data needs	1991
Technical and economic evaluations of newly developed techniques for on-farm pesticide clean-up and disposal (ARS, CSRS-SAES, ERS)	Annually 1991-1995
Use rates and user satisfaction with Water Quality Information Center (NAL)	Annually 1991-1995
Technical evaluations of newly developed field and lab water quality measurement, sampling and analysis techniques (ARS, CSRS-SAES, and user groups)	Annually 1992-1995
Technical evaluation by scientists and users of new management systems models and newly developed alternative management systems (ARS, CSRS-SAES, and user groups)	1992
Economic analysis of input substitution possibilities and economic consequences of alternative management systems designed through initial research efforts (ERS and State Cooperators)	1992
Economic tradeoffs among agricultural productivity, low input agricultural options, environmental regulatory alternatives, the best management approach, and water quality (ERS and State Cooperators)	1992
Interim technical and economic evaluations of additional management options and refinements resulting from 1992 evaluations (ARS, CSRS-SAES, ERS)	1993
Number of extended agrichemical and production management systems adopted, and acres covered by each (SCS, ES)	Annually 1991-1995
Environmental loadings reduced and water quality changes induced by demonstration, education, and technical assistance projects (SCS, ES)	Annually 1991-1995
Evaluation of success of initial demonstration, hydrologic unit, (Section 319) and regional education and technical assistance projects in generating changes in agricultural practices and water quality (SCS, ES, ASCS, ERS)	1993 for 45 regional projects 1994 for 8 demon- stration and 37 hydrologic unit projects
Socioeconomic impacts of new and improved management options for improving ground water quality (ERS and State Cooperators)	1994
Overall program evaluation and progress reports (all lead USDA Agencies)	Annually 1991-1995

Planned Output and Program Support Activities

Public Information

Databases, scientific findings, educational materials, progress reports, and general information will be widely disseminated to appropriate audiences to assure that farmers, environmental groups, Federal and State legislators and program administrators, scientists and the general public are aware of agricultural chemical management and water quality program objectives, activities, findings, and accomplishments.

Objectives: Educate the general public on issues of agriculture's relation to environmental quality, share scientific data, and gain community-wide understanding and support of USDA Water Quality Program goals.

Procedures: Frequent press releases will announce and explain the initiation of the program's component projects. Popular publications, written in lay-language, will be prepared and widely disseminated to accelerate public understanding of nonpoint source pollution problems and solutions, including pesticide management, nutrient management, cost-effectiveness of improved management, and testing and treatment of rural water supplies. Annual reports will also be summarized in shortened and easily comprehended format for broad distribution.

A water quality information center will be established at the National Agricultural Library. The center will pilot test a water quality "hotline," expand its Water Information Network, and provide assistance to action Agencies in accessing and analyzing the literature on past research to provide information for technical assistance and educational activities. Databases and survey results summaries will be made widely available via electronic and print media. Workshops and conferences will be held periodically to share scientific findings and present program evaluation results.

Beneficiaries: Overall, the effectiveness of the President's Water Quality Initiative in gaining high standards of water quality protection will be enhanced by public awareness of its various programs, accurate public knowledge concerning the issues, and public support of its goals. Public concerns over groundwater quality will be reduced.

The scientific community, both here and abroad, will benefit from improved access to data and research findings. This easy access should accelerate external research on agricultural and water quality issues by reducing research redundancy and providing a foundation for expanded research on related agroenvironmental issues.

Leadership and Coordination: Popular news items and publications to inform and educate the general public will be prepared by ES, SCS, ASCS and other principal USDA Agencies, with the assistance of the USDA Office of Information. The National Agricultural Library will contribute substantially to internal and external coordination through its establishment and operation of water quality information networks.

NEW AND SPECIAL GROUNDWATER QUALITY INFORMATION ACTIVITIES

A Water Quality Information Center

The Water Quality Information Center (WQIC) at the National Agricultural Library (NAL) will support USDA's research, education, and information dissemination activities. Center staff will provide an information and referral service; strengthen the AGRICOLA database with water quality research and educational/training materials; enhance communication and information dissemination by maintaining an electronic bulletin board conference on water quality and establishing information networks; and develop information products directed toward researchers, educators, farmers, and consumers. NAL will work closely with key Government Agencies, the land-grant community, and other agricultural constituencies.

Major Workshops and Conferences

Annual Research and Development Conference: A conference to be held during February of each year, the audience to include research scientists and administrators, education and technical assistance professionals, producers, agribusinesses, consumers, and other interested groups. Research and developmental results will be presented with specific effort made at the workshop to integrate results and identify those that are ready for timely transfer and users.

New Directions from Existing Paths

USDA Water Quality Program activities are closely coordinated among USDA Agencies and with the related activities of EPA and Agencies of the Departments of Interior and Commerce under the President's Water Quality Initiative. The USDA Water Quality Program will benefit from related, past and ongoing Departmental efforts in soil and water conservation, public information, research, and extension, and will complement the aims of established programs such as those addressing integrated pest management and low input, sustainable and alternative agricultural systems.

It is clear from the preceding sections that no single planned output from the USDA Water Quality Program is to be produced through the exclusive efforts of a single Agency; all are multi-Agency activities. Also, many of the program's major activities contribute to more than one set of planned outputs. This close integration of program components is predicated upon a network of interagency coordination mechanisms, many of which are in place and others of which are currently under development.

Interagency Coordination: At the Departmental level, the Secretary provides overall direction for the Water Quality Program. Implementation of program plans will be the responsibility of the Department's line Agencies. The Agency heads or their designees will form a special Working Group on Water Quality to oversee and integrate the development, implementation and evaluation of program plans. In addition to the USDA Agencies, the Environmental Protection Agency, the Department of the Interior's U.S. Geological Survey, and the Department of Commerce's National Oceanographic and Atmospheric Administration will be asked to appoint representatives to the work group.

A range of existing, formal and informal interagency agreements can easily accommodate coordination of various new program activities. Where no appropriate mechanism exists, one will be established. For example, committees and working groups have been formed to plan specific aspects of both research and data collection activities, and EPA and USGS representatives have been included in planning meetings.

Relation to Ongoing Programs: New activities to be conducted under the USDA Water Quality Program will take maximum advantage of the structures and outputs of ongoing programs. For example, research on agricultural chemical management systems will capitalize on the products of current research on biological pest control and agricultural engineering. Current research and extension programs on integrated pest management (IMP) and low input, sustainable agriculture (LISA) will both contribute to and benefit by water quality program activities. APHIS will integrate applicable results from the USDA Water Quality Program with its biocontrol and IPM programs and its plant and health monitoring programs. The National Program for Soil and Water Conservation: 1988-97 Update (NCP) provides an integration mechanism for other education and technical assistance elements of USDA's Water Quality Program with current conservation programs. Financial assistance under ASCS's Agricultural Conservation Program will facilitate producers' ability to adopt some water quality protection strategies.

It is expected that by 1994, USDA's approach to interagency implementation and management of its contribution to the President's Initiative on Water Quality will be recognized as an innovative and effective way of addressing Nationally important agricultural problems. Adaptation of this management method to other, ongoing problems will represent a new base for future expansion of the Department's commitment to mutual retention of National agricultural productivity and environmental quality.

SCS WATER QUALITY POLICY

USDA	Regulation (NPS WQ Policy)	9500-7	12/5/86
SCS	General Manual (Water Quality Policy)	401-WQP	5/18/87
SCS	National Bulletin (Ground Water)	130-8-3	3/8/88

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